



SEQUENCE LISTING

<110> Kim, Jihyun Francis
Beer, Steven V.

<120> HYPERSENSITIVE RESPONSE ELICITOR FROM ERWINIA AMYLOVORA
AND ITS USE

<130> 19603/3286

<140> 09/596,958

<141> 2000-06-20

<150> 09/120,927

<151> 1998-07-22

<150> 60/055,108

<151> 1997-08-06

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<170> PatentIn Ver. 2.1

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APR 25 2003

TECH CENTER 1600/2900

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<212> PRT

<213> *Erwinia amylovora*

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Ala Leu Gly Gln Gln Pro Ile Asp Arg Gln Thr Ile Glu Gln Met Ala
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Gln Leu Leu Ala Glu Leu Leu Lys Ser Leu Leu Ser Pro Gln Ser Gly
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Asn Ala Ala Thr Gly Ala Gly Gly Asn Asp Gln Thr Thr Gly Val Gly
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Asn Ala Gly Gly Leu Asn Gly Arg Lys Gly Thr Ala Gly Thr Thr Pro
      85              90              95

Gln Ser Asp Ser Gln Asn Met Leu Ser Glu Met Gly Asn Asn Gly Leu
      100             105             110

Asp Gln Ala Ile Thr Pro Asp Gly Gln Gly Gly Gly Gln Ile Gly Asp
      115             120             125

Asn Pro Leu Leu Lys Ala Met Leu Lys Leu Ile Ala Arg Met Met Asp
      130             135             140

Gly Gln Ser Asp Gln Phe Gly Gln Pro Gly Thr Gly Asn Asn Ser Ala
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Ser Ser Gly Thr Ser Ser Ser Gly Gly Ser Pro Phe Asn Asp Leu Ser
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Gly Gly Lys Ala Pro Ser Gly Asn Ser Pro Ser Gly Asn Tyr Ser Pro
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Val Ser Thr Phe Ser Pro Pro Ser Thr Pro Thr Ser Pro Thr Ser Pro
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Leu Asp Phe Pro Ser Ser Pro Thr Lys Ala Ala Gly Gly Ser Thr Pro
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Val Thr Asp His Pro Asp Pro Val Gly Ser Ala Gly Ile Gly Ala Gly
 225 230 235 240

Asn Ser Val Ala Phe Thr Ser Ala Gly Ala Asn Gln Thr Val Leu His
 245 250 255

Asp Thr Ile Thr Val Lys Ala Gly Gln Val Phe Asp Gly Lys Gly Gln
 260 265 270

Thr Phe Thr Ala Gly Ser Glu Leu Gly Asp Gly Gly Gln Ser Glu Asn
 275 280 285

Gln Lys Pro Leu Phe Ile Leu Glu Asp Gly Ala Ser Leu Lys Asn Val
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Thr Met Gly Asp Asp Gly Ala Asp Gly Ile His Leu Tyr Gly Asp Ala
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Lys Ile Asp Asn Leu His Val Thr Asn Val Gly Glu Asp Ala Ile Thr
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Val Lys Pro Asn Ser Ala Gly Lys Lys Ser His Val Glu Ile Thr Asn
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Ser Ser Phe Glu His Ala Ser Asp Lys Ile Leu Gln Leu Asn Ala Asp
 355 360 365

Thr Asn Leu Ser Val Asp Asn Val Lys Ala Lys Asp Phe Gly Thr Phe
 370 375 380

Val Arg Thr Asn Gly Gly Gln Gln Gly Asn Trp Asp Leu Asn Leu Ser
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His Ile Ser Ala Glu Asp Gly Lys Phe Ser Phe Val Lys Ser Asp Ser
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 <213> *Erwinia amylovora*

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Pro Thr Ala Val Pro Val Lys Gly Ser Tyr Asp Gly Gly Met Lys Arg
 35 40 45

Phe Glu Arg Glu Pro Lys Val Cys Lys Gly Gln Asp Glu Thr Gly Glu
 50 55 60

Lys Asp Ala Met Phe Ile Leu Glu Asn Gly Ala Thr Leu Ser Asn Val
 65 70 75 80

Ile Ile Gly Ala Ser Gln Ala Glu Gly Val His Cys Lys Gly Thr Cys
 85 90 95

Thr Leu Asn Asn Val Trp Trp Ala Asp Val Cys Glu Asp Ala Val Thr
 100 105 110

Leu Lys Gln Thr Ser Gly Thr Ser Tyr Ile Asn Gly Gly Gly Ala Phe
 115 120 125

His Ala Ser Asp Lys Ile Ile Gln Phe Asn Gly Arg Gly Thr Val His
 130 135 140

Val Lys Asp Phe Tyr Ala Glu Asp Tyr Gly Lys Leu Ser Arg Ser Cys
 145 150 155 160

Gly Asn Cys Lys Asp Asn Gly Gly Pro Arg Asn Val Ile Val Glu Asn
 165 170 175

Ser Val Ala Val Asp Gly Gly Val Leu Cys Gly Ile Asn Thr Asn Tyr
 180 185 190

Gly Asp Thr Cys Lys Val Ile Asn Ser Cys Gln Asp Lys Gly Lys Tyr
 195 200 205

Cys Asp Arg Tyr Glu Gly Asn Ser Ser Gly Lys Glu Pro Thr Lys Ile
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Gly Ser Gly Pro Asp Gly Lys Tyr Cys Thr Val Thr Gly Ser Thr Thr
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Ser Cys

<210> 5

<211> 244

<212> PRT

<213> Fusarium solani f. sp. pisi

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Ala Val Thr Thr Val Leu Pro Ala Ser Ala Gly Val Gln Ser Glu Pro
 20 25 30

Thr Ala Ile Pro Val Arg Lys Gly Asp Lys Tyr Asn Gly Gly Met Lys
 35 40 45

Arg Phe Val Arg Asn Pro Thr Thr Cys Lys Asp Gln Tyr Glu Thr Gly
 50 55 60

Glu Lys Asp Ala Ser Phe Ile Leu Glu Asp Gly Ala Thr Leu Ser Asn
 65 70 75 80

Val Ile Ile Asp Arg Ser Ser Gly Glu Gly Val His Cys Lys Gly Thr
 85 90 95

Cys Thr Leu Asn Asn Val Trp Trp Ala Asp Val Cys Glu Asp Ala Ala
 100 105 110

Thr Phe Lys Gln Lys Ser Gly Thr Ser Thr Ile Asn Gly Gly Gly Ala
 115 120 125

Phe Ser Ala Gln Asp Lys Val Leu Gln Phe Asn Gly Arg Gly Thr Leu
 130 135 140

Asn Val Asn Asp Phe Tyr Val Gln Asp Tyr Gly Lys Leu Val Arg Asn
 145 150 155 160

Cys Gly Asn Cys Glu Gly Asn Gly Gly Pro Arg Asn Ile Asn Ile Lys
 165 170 175

Gly Val Val Ala Lys Asn Gly Gly Glu Leu Cys Gly Val Asn His Asn
 180 185 190

Tyr Gly Asp Val Cys Thr Ile Thr Asp Ser Cys Gln Asn Lys Gly Lys
 195 200 205

Ser Cys Gln Ala Tyr Thr Gly Asn Asp Gln Lys Lys Glu Pro Pro Lys
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Phe Gly Pro Ala Gly Asp Asn Gly Lys Ser Cys Leu Val Lys Ser Leu
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Arg Thr Asn Cys

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<213> Fusarium solani f. sp. pisi

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Ile Ser Asn Ser Lys Val Ile Glu Val Lys Ala Gly Gln Val Tyr Asp
 20 25 30

Gly Lys Trp Ala Lys Tyr Asp Arg Gly Ser Gly Ala Cys Lys Gly Gln
 35 40 45

Asn Glu Gly Gly Asp Lys Asp Ala Val Phe Leu Leu His Glu Gly Ala
 50 55 60

Thr Leu Lys Asn Val Ile Ile Gly Lys Asp Gln Ser Glu Gly Val His

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Cys Lys Gly His Cys Thr Leu Glu Phe Val Trp Phe Glu Asp Val Cys						
	85		90		95	
Glu Asp Ala Ile Ser Ile Ala Gly Lys Glu Ser Trp Ile Ile Gly Gly						
	100		105		110	
Gly Ala Tyr His Ala Ser Asp Lys Val Val Gln His Asn Gly Cys Gly						
	115		120		125	
Thr Val Asn Ile Ile Asn Phe Tyr Val Glu Asp Tyr Gly Lys Leu Tyr						
	130		135		140	
Arg Ser Cys Gly Asn Cys Ser Lys Gln Cys Lys Arg Asn Val Tyr Ile						
	145		150		155	160
Glu Gly Val Thr Ala Lys Asn Gly Gly Glu Leu Ala Gly Ile Asn Ala						
	165		170		175	
Asn Tyr Gly Asp Thr Ala Thr Leu Lys Asn Val Cys Ala Asp Ala Lys						
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Gln Lys Cys Thr Met Tyr Asn Gly Cys Ala Gly Gly Cys Glu Pro Lys						
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Lys Ile Gly Ala Cys Pro Ala						
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20 25 30
Ala Gly Trp Val Arg Tyr Asp Arg Gly Val Lys Cys Ser Gly Gln Ala
35 40 45
Glu Gly Gly Ser Lys Asp Ala Val Phe Ile Leu Glu Glu Gly Ala Thr
50 55 60

Leu Arg Asn Val Ile Ile Gly Ala Asn Gln Arg Glu Gly Ile His Cys
65 70 75 80

Lys Gly Ser Cys Asn Ile Glu Phe Ala Trp Phe Glu Asp Val Cys Glu
85 90 95

Asp Ala Ile Ser Ile Leu Gly Ser Gly Thr Ala Asn Ile Ile Gly Gly
100 105 110

Gly Ala Tyr His Ala Ser Asp Lys Val Ile Gln His Asn Gly Cys Gly
115 120 125

His Val Asn Ile Val Asn Phe Tyr Ala Asn Asp Tyr Gly Lys Val Tyr
130 135 140

Arg Ser Cys Gly Asn Cys Lys Gly Asn Thr Asn Cys Lys Arg Ser Val
145 150 155 160

His Met Glu Gly Thr Thr Ala Val Lys Gly Gly Glu Leu Ile Gly Ile
165 170 175

Asn Thr Asn Tyr Gly Asp Lys Ala Thr Tyr Ser Asn Asn Cys Tyr Pro
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Cys Glu Pro Ser Lys Ala Ala Lys Cys
210 215

<210> 8

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<212> PRT

<213> *Erwinia carotovora* pv *carotovora*

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Asn Ala Thr Tyr Leu Ser Trp Ser Thr Asp Ala Gly Asn Val Val Arg
35 40 45

Gln Asp Val Tyr Arg Ser Thr Ser Ser Ala Gln Ala Gly Ser Glu Lys
50 55 60

Ile	Ala	Glu	Leu	Asn	Ser	Ser	Asp	Arg	Thr	Phe	Thr	Asp	Leu	Thr	Ala	
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Asn	Pro	Gln	Ser	Asp	Tyr	Trp	Tyr	Trp	Val	Asp	Thr	Val	Ser	Gly	Asn	
				85					90					95		
Asn	Ser	Val	Leu	Lys	Ser	Asn	Ala	Ala	Ser	Thr	Ala	Pro	Ala	Pro	Leu	
			100					105					110			
Arg	Ala	Ala	Pro	Leu	Lys	Ala	Ala	Ser	Pro	Glu	Cys	Lys	Ala	Gly	Ala	
		115					120					125				
Val	Ile	Lys	Asp	Lys	Thr	Val	Asp	Cys	Gly	Gly	Ile	Thr	Leu	Gly	Leu	
	130					135					140					
Ser	Cys	Ser	Gly	Asp	Ser	Asp	Lys	Gln	Pro	Pro	Val	Ile	Thr	Leu	Glu	
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Asn	Ala	Thr	Ile	Lys	Asn	Leu	Arg	Ile	Ser	Glu	Lys	Gly	Gly	Ser	Asp	
				165					170					175		
Gly	Ile	His	Cys	Lys	Ser	Gly	Asn	Cys	Arg	Ile	Glu	Asn	Val	Ile	Trp	
			180					185					190			
Glu	Asp	Ile	Cys	Glu	Asp	Ala	Ala	Thr	Asn	Leu	Gly	Lys	Thr	Met	Thr	
		195					200					205				
Ile	Val	Gly	Gly	Val	Ala	His	Asn	Thr	Thr	Asn	Gly	Pro	Gly	Gly	Lys	
	210					215					220					
Pro	Asp	Lys	Val	Leu	Gln	Gln	Asn	Ala	Lys	Asn	Ser	His	Thr	Ile	Val	
225					230					235					240	
Gln	Gly	Lys	Phe	Thr	Leu	Thr	Gly	Gln	His	Gly	Lys	Leu	Trp	Arg	Ser	
				245					250					255		
Cys	Gly	Asp	Cys	Thr	Asn	Asn	Gly	Gly	Pro	Arg	Asn	Leu	Thr	Ile	Ile	
			260					265					270			
Ser	Ala	Thr	Val	Asn	Gly	Thr	Ile	Asp	Ser	Ile	Ala	Gly	Val	Asn	Arg	
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Asn	Phe	Gly	Asp	Val	Ala	Glu	Ile	Arg	Asp	Leu	Arg	Ile	Lys	Gly	Tyr	
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Lys	Glu	Gly	Lys	Pro	Pro	Val	Cys	Glu	Glu	Phe	Asn	Gly	Val	Glu	Lys	
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Cys Lys Val Ser Arg Ser Asn Val Lys Pro Leu
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<210> 9

<211> 347

<212> PRT

<213> Erwinia carotovora pv carotovora

<400> 9

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Phe Gln Ala Gln Ala Asp Asp Thr Met Leu Met Leu Leu Lys Lys Asp
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 35 40 45

Gln Asp Val Tyr Arg Ser Thr Asn Asn Ala Gln Ala Gly Ser Glu Lys
 50 55 60

Ile Ala Glu Leu Asn Ser Thr Asp Arg Thr Phe Thr Asp Leu Thr Ala
 65 70 75 80

Asn Pro Lys Ser Asp Tyr Trp Tyr Trp Val Asp Thr Val Ser Ser Asn
 85 90 95

Asn Asn Val Gln Lys Ser Asn Ala Ala Gln Thr Ala Pro Ala Pro Leu
 100 105 110

Arg Ala Ala Pro Leu Lys Ala Ala Ser Ser Glu Cys Lys Ala Gly Ala
 115 120 125

Val Ile Lys Asp Lys Thr Val Asp Cys Gly Gly Ile Thr Leu Gly Leu
 130 135 140

Ser Cys Thr Gly Asp Ser Asp Lys Gln Pro Pro Val Ile Thr Leu Glu
 145 150 155 160

Asn Ala Thr Ile Lys Asn Leu Arg Ile Ser Glu Lys Gly Gly Ser Asp
 165 170 175

Gly Ile His Cys Lys Ser Gly Asn Cys Arg Ile Glu Asn Val Ile Trp

180	185	190
Glu Asp Val Cys Glu Asp Ala Ala Thr Asn Leu Gly Lys Thr Met Thr		
195	200	205
Ile Val Gly Gly Val Ala His Asn Thr Thr Asn Gly Pro Gly Gly Lys		
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Pro Asp Lys Val Leu Gln Gln Asn Ala Lys Asn Ser His Thr Ile Val		
225	230	235
Gln Gly Asn Phe Thr Leu Thr Gly Gln His Gly Lys Leu Trp Arg Ser		
245	250	255
Cys Gly Asp Cys Thr Asn Asn Gly Gly Pro Arg Asn Leu Thr Ile Ile		
260	265	270
Ser Ala Thr Val Asn Gly Thr Ile Asp Ser Ile Ala Gly Val Asn Arg		
275	280	285
Asn Phe Gly Asp Val Ala Glu Ile Arg Asp Leu Arg Ile Lys Asn Tyr		
290	295	300
Lys Ala Gly Asn Pro Lys Ile Cys Glu Glu Phe Lys Gly Ile Glu Lys		
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Cys Lys Val Ser Arg Ser Asn Val Lys Ala Leu		
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<212> PRT

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<221> UNSURE
<222> (166)
<223> Xaa at position 166 is His, Asn, Gly, or Ala

<220>
<221> UNSURE
<222> (167)
<223> Xaa at position 167 is Ile, Ser, Val, or Thr

<220>
<221> UNSURE
<222> (170)
<223> Xaa at position 170 is Glu, Val, Lys, or Gly

<220>
<221> UNSURE
<222> (171)
<223> Xaa at position 171 is Asp, Asn, Lys, or Thr

<220>
<221> UNSURE
<222> (173)
<223> Xaa at position 173 is Lys or no residue

<220>
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<222> (174)
<223> Xaa at position 174 is Phe or no residue

<220>
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<223> Xaa at position 175 is Ser or no residue

<220>
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<223> Xaa at position 176 is Phe or no residue

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<222> (177)
<223> Xaa at position 177 is Val or no residue

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<222> (178)
<223> Xaa at position 178 is Lys or no residue

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<222> (182)
<223> Xaa at position 182 is Gly, Cys, Ala, or Ile

<220>
<221> UNSURE
<222> (184)
<223> Xaa at position 184 is Leu, Ile, or Val

<220>
<221> UNSURE

<222> (186)
<223> Xaa at position 186 is Val, Thr, His, Ala, or Arg

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<221> UNSURE
<222> (193)
<223> Xaa at position 193 is Leu, Lys, Thr, or Glu

<220>
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<222> (195)
<223> Xaa at position 195 is Asp, Ile, Thr, Lys, Ser, or Arg

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<222> (196)
<223> Xaa at position 196 is Val, Asn, or Asp

<220>
<221> UNSURE
<222> (197)
<223> Xaa at position 197 is Glu, Ser, Val, Asn, or Leu

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<222> (199)
<223> Xaa at position 199 is Ile or no residue

<220>
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<222> (200)
<223> Xaa at position 200 is Lys or no residue

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<222> (201)
<223> Xaa at position 201 is Gly, Asn, or no residue

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<221> UNSURE
<222> (202)
<223> Xaa at position 202 is Tyr or no residue

<220>
<221> UNSURE
<222> (203)
<223> Xaa at position 203 is Lys or no residue

<220>
<221> UNSURE
<222> (204)
<223> Xaa at position 204 is His, Gln, Ala, Tyr, or Glu

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<222> (205)
<223> Xaa at position 205 is Tyr, Asp, Asn, or Gly

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<222> (207)
<223> Xaa at position 207 is Val, Gly, Lys, or Pro

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<221> UNSURE
<222> (208)
<223> Xaa at position 208 is Pro, Lys, Gln, or Thr

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<221> UNSURE
<222> (209)
<223> Xaa at position 209 is Met, Tyr, Ser, Lys, Gln,
Val, or Ile

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<223> Xaa at position 211 is Ala, Asp, Gln, Thr, or Glu

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<223> Xaa at position 212 is Asn, Arg, Ala, Met, Gly, or
Glu

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<223> Xaa at position 214 is Lys, Glu, Thr, or Asn

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<221> UNSURE
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<223> Xaa at position 216 is Ala, Asn, Cys, Val, or Ile

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 <223> Xaa at position 218 is Ser, Gln, or Lys

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 <222> (221)
 <223> Xaa at position 221 is Cys or Gly

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 <223> Xaa at position 224 is Thr, Pro, Lys, Glu, or Asp

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 <223> Xaa at position 226 is Ile, Phe, Ser, or Tyr

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 <223> Xaa at position 228 is Ser, Pro, Ala, or Glu

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 <221> UNSURE
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 <223> Xaa at position 229 is Gly, Ala, Cys, or Phe

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 <222> (230)
 <223> Xaa at position 230 is Pro, Gly, Lys, or Trp

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Lys Gly Xaa Xaa Tyr Asp Gly Xaa Xaa Xaa Xaa Phe Xaa Arg Xaa Xaa
 20 25 30

Xaa Xaa Cys Xaa Gly Gln Xaa Glu Xaa Gly Asp Lys Asp Ala Xaa Phe

35										40					45							
Ile	Leu	Glu	Glu	Gly	Ala	Thr	Leu	Lys	Asn	Val	Xaa	Ile	Ile	Gly	Xaa							
50					55					60												
Xaa	Xaa	Xaa	Glu	Gly	Ile	His	Cys	Lys	Xaa	Gly	Xaa	Cys	Xaa	Ile	Glu							
65			70					75					80									
Asn	Val	Trp	Trp	Glu	Asp	Val	Cys	Glu	Asp	Ala	Ile	Xaa	Xaa	Xaa	Xaa							
				85			90				95											
Xaa	Thr	Met	Xaa	Xaa	Xaa	Ser	Gly	Xaa	Xaa	Xaa	Ile	Xaa	Gly	Gly	Gly							
				100			105					110										
Ala	Xaa	His	Ala	Ser	Asp	Lys	Val	Leu	Gln	Xaa	Asn	Gly	Xaa	Gly	Xaa							
			115			120					125											
Xaa	Xaa	Ile	Val	Xaa	Xaa	Xaa	Xaa	Phe	Tyr	Xaa	Xaa	Asp	Tyr	Gly	Lys							
130			135					140														
Leu	Xaa	Arg	Ser	Cys	Gly	Asn	Cys	Xaa	Xaa	Asn	Xaa	Gly	Xaa	Xaa	Arg							
145		150					155					160										
Xaa	Val	Xaa	Ile	Xaa	Xaa	Xaa	Val	Ala	Xaa	Xaa	Gly	Xaa	Xaa	Xaa	Xaa							
				165			170					175										
Xaa	Xaa	Gly	Glu	Leu	Xaa	Gly	Xaa	Asn	Xaa	Asn	Tyr	Gly	Asp	Val	Ala							
			180			185					190											
Xaa	Ile	Xaa	Xaa	Xaa	Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Lys	Xaa	Xaa							
195			200					205														
Xaa	Cys	Xaa	Xaa	Tyr	Xaa	Gly	Xaa	Glu	Xaa	Gly	Lys	Xaa	Glu	Xaa	Xaa							
210			215					220														
Lys	Xaa	Gly	Xaa	Xaa	Xaa	Asp																
225		230																				